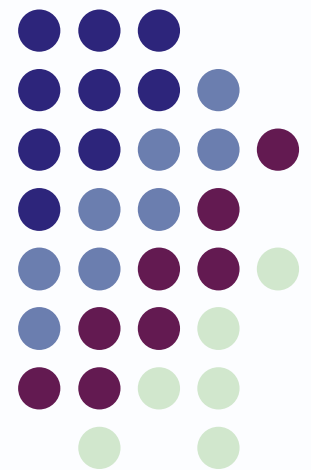


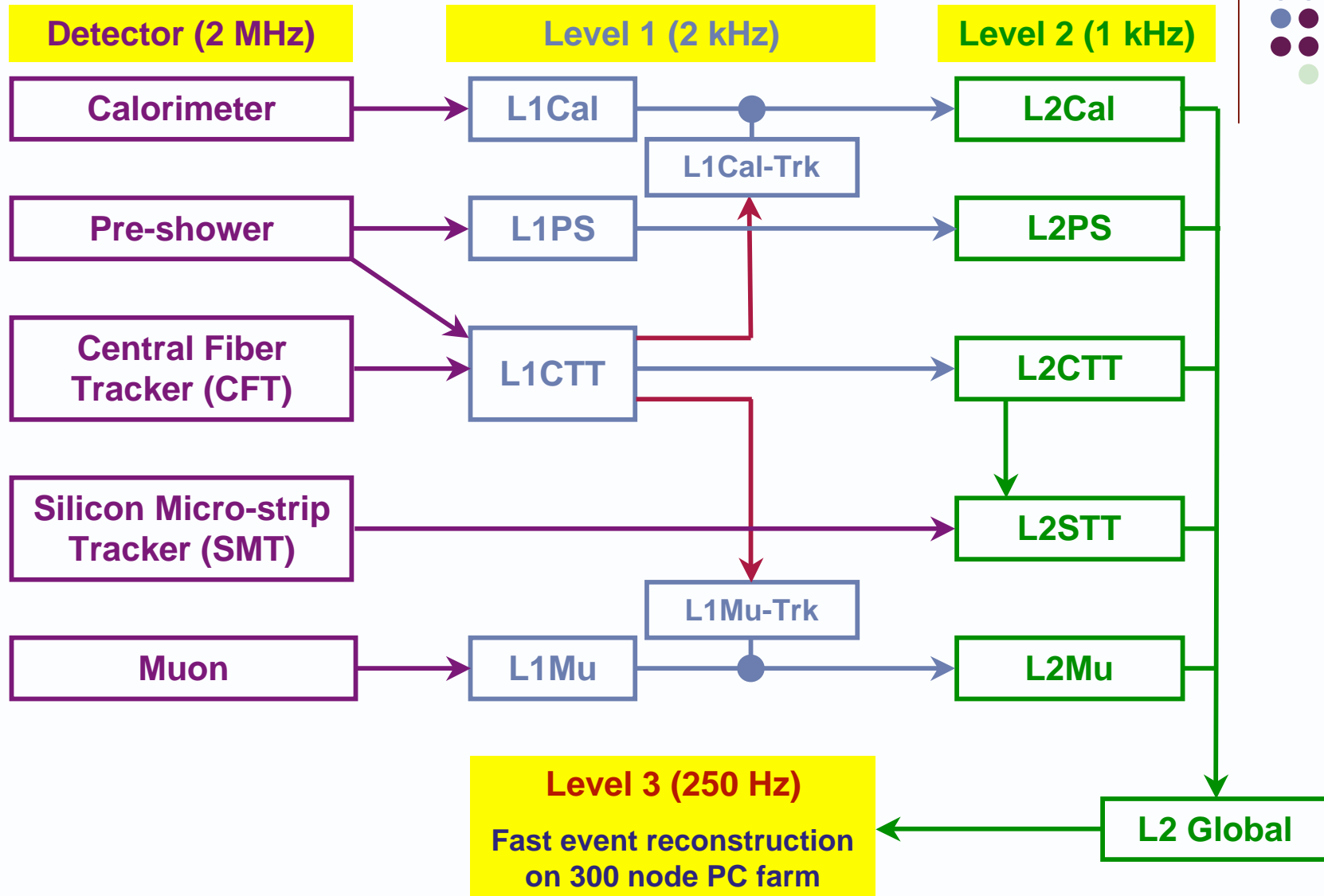
DØ Triggering at High Luminosity

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Fermilab All Experimenters Meeting
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The DØ Run2b Trigger



Trigger Strategy



- Object oriented
 - Muons, electrons, taus, jets, MET,...
 - General purpose triggers shared among physics groups, each group gets their “fair share” of the bandwidth
 - High efficiency and redundancy
 - Various combinations of tight and loose conditions
 - Keep High pT “core” triggers unprescaled at all luminosities
 - Some B physics triggers prescaled at high luminosity
- Rate “guidelines”
 - Keep L1/L2/L3 rates below their technically allowed values with room to spare
 - $L1/L2 < 1800/850$ Hz
 - Rate to tape kept at a store average value of 100 Hz (up to 250 Hz at high instantaneous luminosities).

Trigger Status



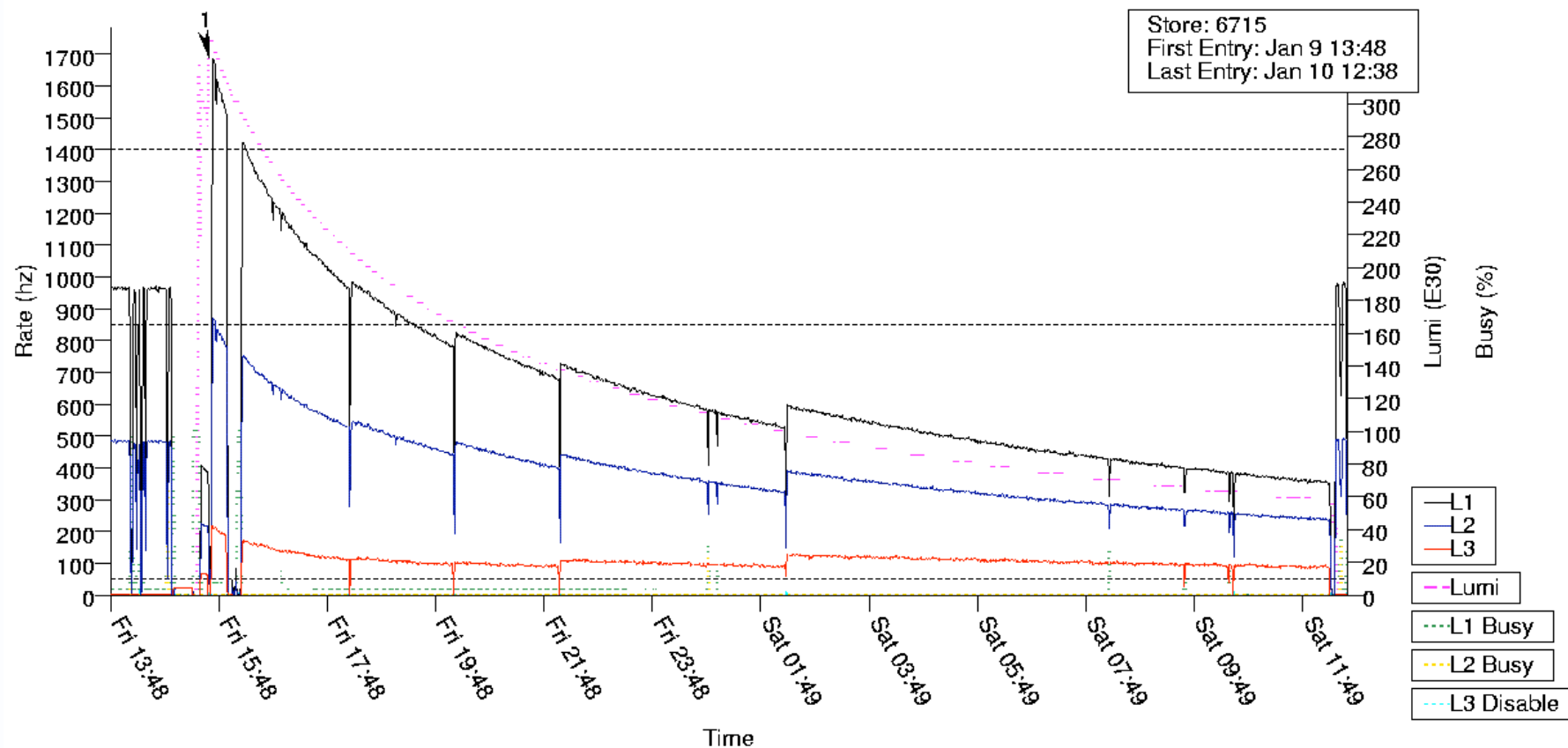
- Current trigger list (v16) went online in March 2008
 - Meets L1/L2 rate guidelines up to 360E30 with excellent data taking and physics efficiency - core triggers remain unprescaled.
 - Rate to tape is above spec for stores starting above 300E30, but well within the data acquisition limit.
 - This is presently an issue as events taken at high luminosity take longer to reconstruct offline. We are working on ways to alleviate this
 - Working from both sides: streamlining triggers and increasing reconstruction resources

A high luminosity store



353E30

Store: 6715
First Entry: Jan 9 13:48
Last Entry: Jan 10 12:38



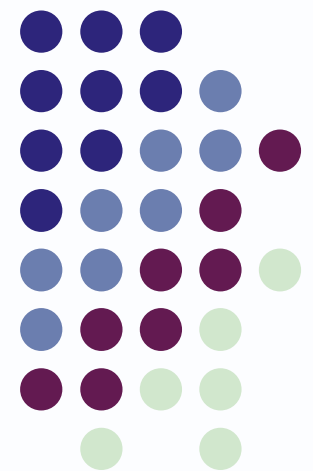
Data taking efficiency at high luminosity



Store	Run number	Initial lumi	efficiency
6625	247857	342E30	92%
6683	248345	338E30	92%
6715	248672	330E30	94%
6816	249732	321E30	79%
6832	249888	338E30	93%
6833	249901	324E30	92%
6834	249918	312E30	93%
6917	250496	328E30	92%

- No drop in efficiency at high luminosity
 - Run 249732 had a hardware failure

Triggering above 360E30

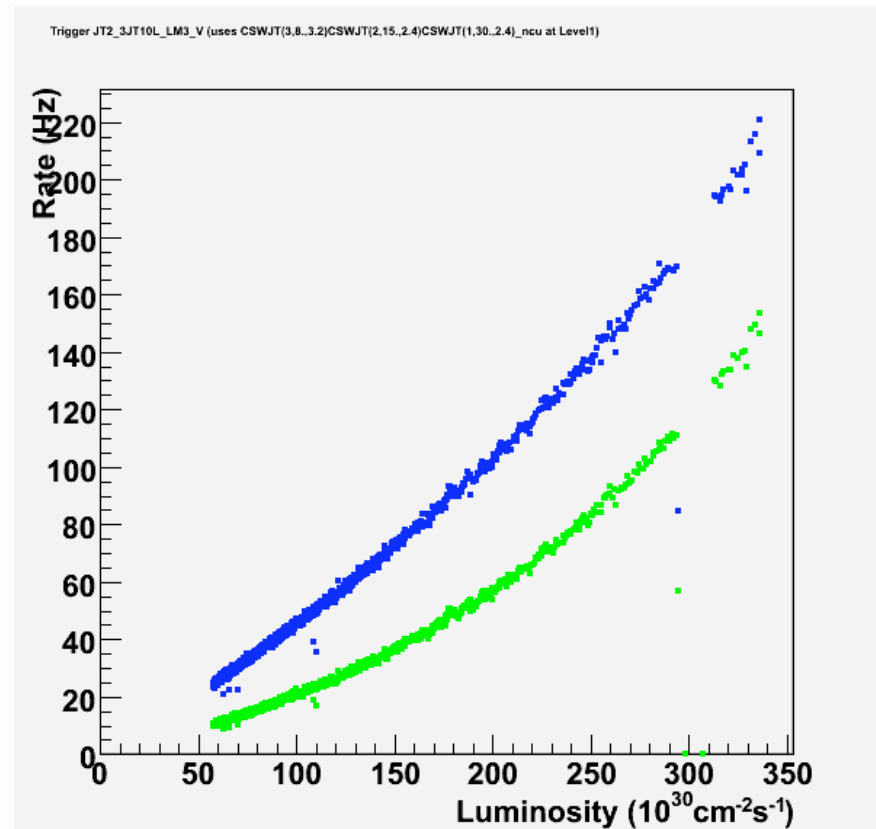
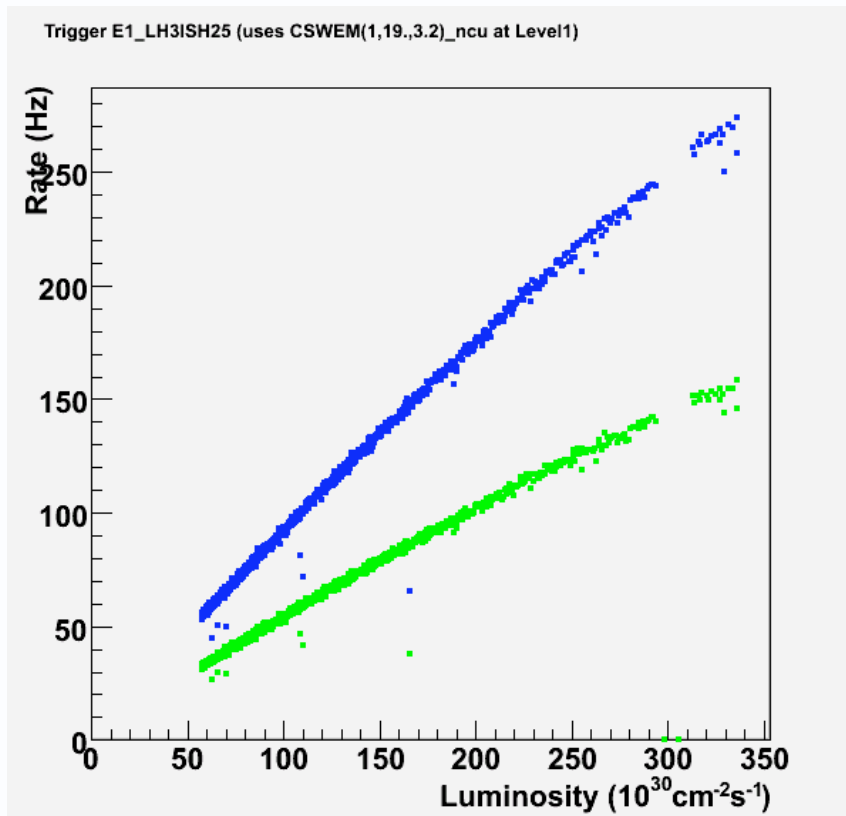


Triggers with the highest rates



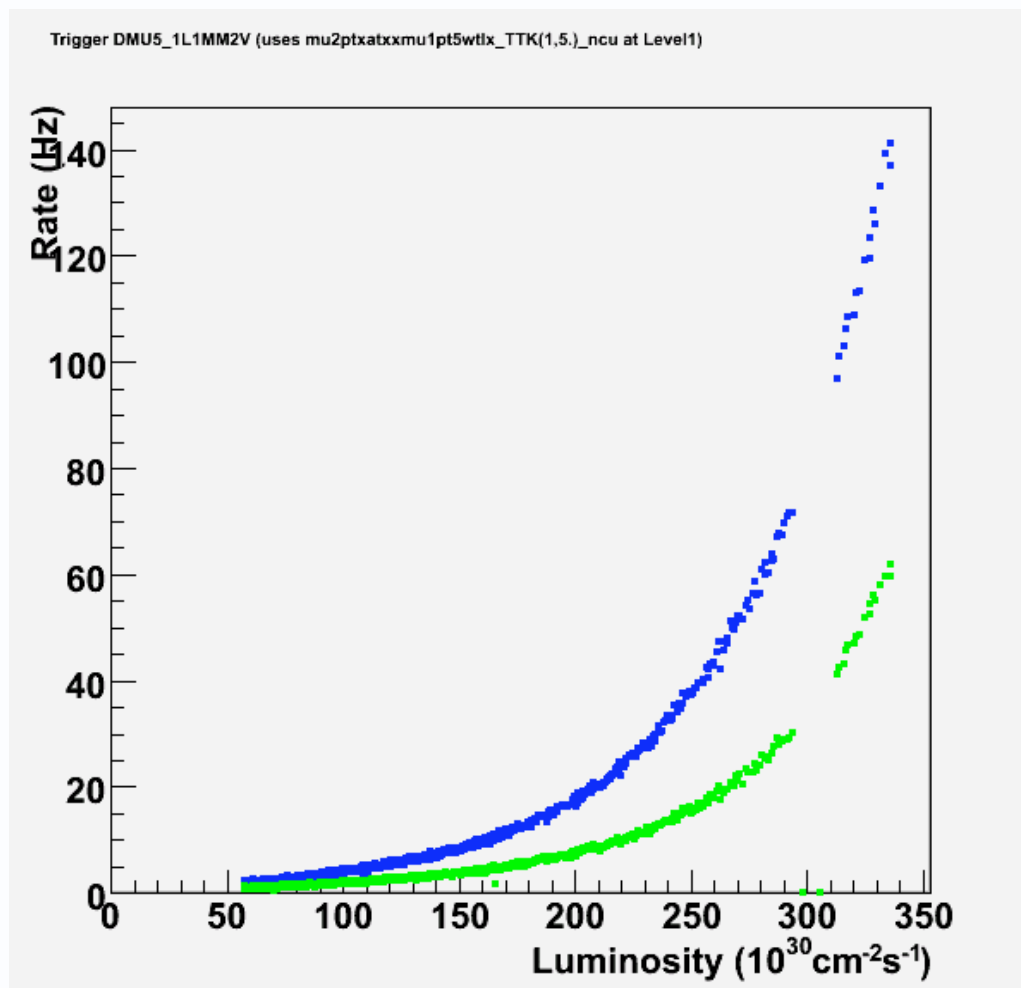
single electron

multi jet



Some loose triggers are taking off

loose dimuon

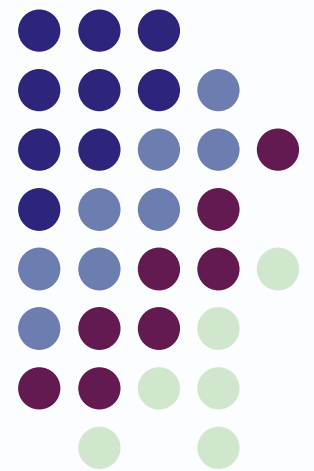


Plans for 400E30



- The L1/L2 rates for the core triggers are stable and these can remain unprescaled.
- The L1/L2 rates of several looser versions of core triggers will increase substantially above 370E30. These triggers will be prescaled above this luminosity as needed to keep within the rate limits.
- This will have a very small effect on the overall efficiency of the trigger list, but the overall trigger efficiency will be a bit more sensitive to hardware failures.

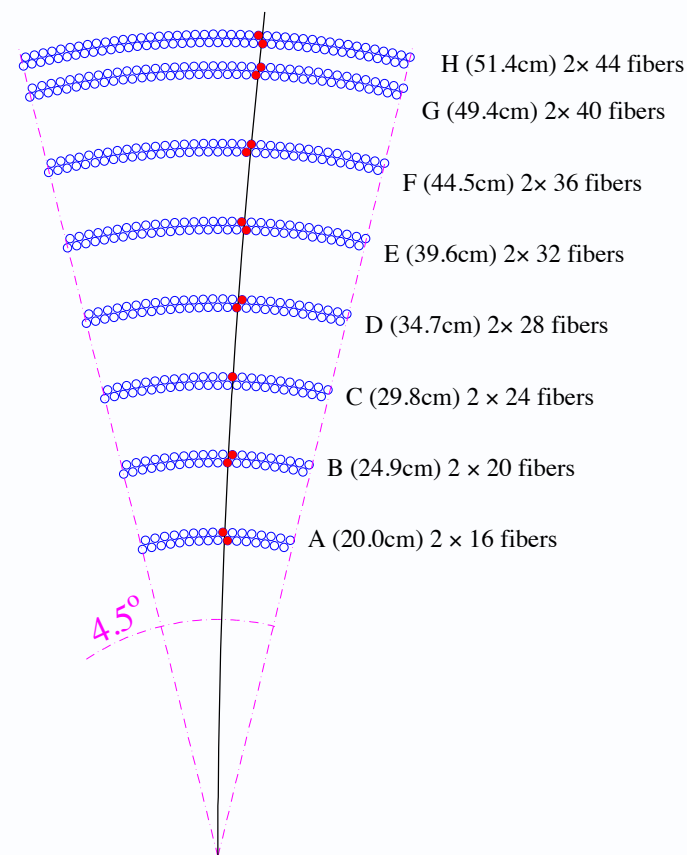
Backup Slides



Level 1 trigger system



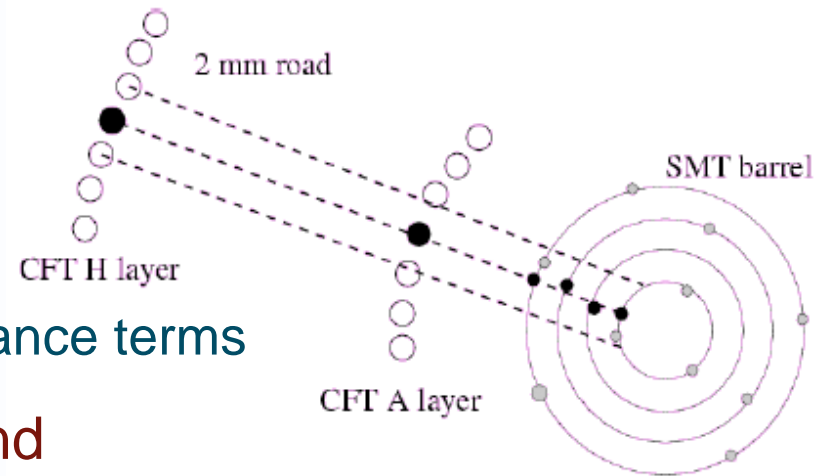
- Central Track Trigger (CTT) uses axial layers of the Central Fiber Tracker
 - provides track terms in 4 pT bins, isolation terms, and sends track lists to L1 cal and L1 muon
- Calorimeter
 - coarse 0.2 x 0.2 eta-phi towers
 - Cal-CTT match (L1 tau trigger now!)
- Muon
 - Scintillator and wire hits
 - Muon-CTT match
- No silicon
- Pass rate of 2 kHz set by silicon digitization (no extra event buffer) and muon readout



Level 2 trigger system



- Silicon track trigger
 - Better track pT resolution
 - Primary vertex finding
 - Track impact parameter significance terms
- L1 Muon and Calorimeter (jet and electron) objects are refined
- Global variables allowing combinations of objects
- Provides a factor of 2 rejection to get to output rate limit of 1 kHz, set by precision calorimeter readout



Level 3 trigger system



- Software triggers run on a 300 node pc farm
- Provides fast reconstruction of the event - all physics objects
 - Muons,
 - Electrons,
 - Jets,
 - Tracks,
 - Taus,
 - MET,
 - Isolation,
 - Vertexing,
 - B-tagging,
 - Isolation,
 - Invariant mass,
 - And any combination of the above

